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MINOR NOTICES.

A MONOGRAPH of the hypogaeous fungi of California has been published by Mr. H. W. Harkness.[6] One hundred and eight species are described, of which fifty-eight are new, with five new genera. There is unfortunately no artificial key or synopsis, so that the work will be of little value except to the specialist, and we fear he will have occasion to complain of the brevity of the diagnoses of new genera and species. These rarely exceed two or three lines, with few or no explanatory remarks.—C. R. B.

F. V. COVILLE and G. N. ROSE have published a list of plants collected by Mr. and Mrs. Leonhard Stejneger on the Commander islands during 1895 and 1897. These islands bear no trees, due, the authors think, to the violent wet winds that sweep over them during the winter. The geographic relationship of the flora is primarily Kamchatkan, with strong Aleutian and arctic elements, and there is almost no insular specialization. The list is reprinted from *The fur seals and fur-seal islands of the North Pacific Ocean*, part 4, pp. 352–361. 1899.—J. M. C.

"BOTANIZING" is the title of the new book by the author of *The Botanical Collector's Handbook*, Professor W. W. Bailey, of Brown University.[7] It embraces the material of the former volume but is completely rewritten and greatly improved. The amateur will here find the completest and best directions for all kinds of botanical collecting. The author has been assisted by various specialists, some making only general suggestions, others preparing the sections relating to particular families of phanerogams and the larger groups of cryptogams. Fifteen illustrations show useful apparatus for preservation of specimens. An index should have been added. The author (*in litt.*) asks readers to delete the words "the steppes of Asia or" on page 4, line 7.—C. R. B.

NOTES FOR STUDENTS

IN A PRELIMINARY PAPER read before the Botanical Society of America, at Columbus, Dr. Charles E. Bessey discussed the probable significance of apetaly and its connection with diclinism and diœciousness. He suggested that well-established plants, as shrubs and trees, as well as those which mass their flowers may dispense with petals. Petaly is apparently correlated with entomophily, and apetaly with anemophily. Apetaly and diclinism appear to result from progressively increasing aphanisis. Lists of apetalous and diœcious plants were given and discussed.

[6] Proc. Calif. Acad. Sci. III. Bot. **1**:241–286, *dbl. col. pl. 42–45*. 1899.

[7] BAILEY, W. W.: Botanizing: a guide to field-collecting and herbarium work. 12mo. pp. xiv + 142. *figs. 15*. Providence: Preston & Rounds. 1899.

AT THE COLUMBUS MEETING of the A. A. A. S., H. L. Bolley presented to Section G a paper by Lawrence Waldron on "The occurrence of calcium oxalate and lignin during the differentiation of the buds of *Prunus Americana*." It was found that the crystals of calcium oxalate occur in quite surprising abundance in the meristematic tissues of the bud, and in the very youngest stages of the scales of the bud; and that the oxalate becomes lessened in proportionate quantity as the tissues develop. Lignification of the hairs and scales of the bud commences at a very early period of their development. While it is usually assumed that calcium oxalate is a waste product of metabolism, its occurrence in such large quantities in the meristematic cells of the bud and scales would seem to indicate a question as to whether it has not a definite value at this point at this particular time in the life history of the plant.

PROTHALLIA OF LYCOPODIUM are so rare that the present paper, although based upon only half a dozen specimens, is a valuable contribution.[8] These prothallia resemble those of *Botrychium Virginianum* as described by Jeffreys. A vertical section shows a limiting layer of colorless cells, above which are several cells invested by an endophytic fungus. The cells of the upper half of the prothallium are entirely free from the fungus. The antheridium is developed from a single superficial cell and at maturity does not project above the surface. The archegonium, also developed from a single superficial cell, projects considerably. There are six or eight canal cells, the lowest presumably a ventral canal cell.

The value of the prothallium as a taxonomic character is discussed at some length, and the writer concludes that species of Lycopodium which possess similar prothallia cannot, on that ground alone, be regarded as closely related. The prothallium of *Botrychium Virginianum* in form, texture, endophytic fungus, position of sexual organs and subterranean saprophytic habit resembles the prothallia of *Lycopodium*, but the resemblance merely shows how an appearance of genetic relationship may result from modifications due to a similar subterranean saprophytic habit.—CHAS. J. CHAMBERLAIN.

AN EXCEEDINGLY interesting account of the fertilization of *Batrachospermum Bohneri* by W. Schmidle[9] has recently appeared. This author has worked on material gathered in Germany and his conclusions, while agreeing with my own studies in respect to the presence and behavior of the chromatophores in the trichogyne and antherozoids, are very different as regards the activities of the nuclei and processes of fertilization.

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[8] LANG, W. H.: The prothallus of *Lycopodium clavatum* L. Ann. Bot. **13**: 279–317. 1899.

[9] W. SCHMIDLE: Einiges über die Befruchtung, Keimung, und Haarinsertion von Batrachospermum. Bot. Zeit. **57**^{1}: 125. 1899.

The antherozoids of *B. Bohneri* differ from any that I have ever seen in having almost invariably two nuclei. When the antherozoid fuses with the trichogyne the nucleus nearest to the point of application passes into that structure and is usually followed by the second, which however may remain behind in the antherozoid.

The trichogyne and carpogonium of *B. Bohneri* have only one nucleus which lies in the carpogonium. One of the nuclei from an antherozoid passes the length of the trichogyne into the carpogonium through the constriction between the two structures. Fertilization takes places in the carpogonium, where the male nucleus fuses with the female.

The passage of the male nucleus causes the protoplasm in the trichogyne to gather into a peculiar dense mass which indicates a certain stage in the process of fertilization.

After fertilization the carpogonium becomes cut off from the trichogyne, and the latter may then contain one or more nuclei introduced from one or several antherozoids that fuse with it. Extensive fragmentation of these nuclei may occur later.

The phenomena described are in all respects compatible with our knowledge of the processes of fertilization. They accord fully with the accounts of Oltmanns and Wille for other members of the Rhodophyceæ.

I have realized for a long time that my account of Batrachospermum[10] left the problems considered in a very unsatisfactory state. The conditions that I described were exceptional and at variance with those so generally present in related groups of plants. However, at the time, I was convinced of the correctness of my position, and since that publication I have several times re-examined my material, always finding the same structures that I figured and described.

My chain of evidence is nevertheless incomplete in that I have not seen the mitotic figure which should give rise to the nucleus that I have supposed to be normally present in the trichogyne. Such a stage would be exceedingly difficult to find and recognize, and I have searched persistently for it. It is very important and even necessary for my views that its existence should be established. I have not been able to do this as yet, and in this respect acknowledge a weakness in my former position.

I do not wish to criticise the work of Schmidle further than to suggest the necessity of the most thorough studies in cytology in investigations of this sort. I wish we might have the details of nuclear fusion in fertilization and nuclear division in the antherozoid, together with an absolutely complete series of stages illustrating the process of fertilization.

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[10] DAVIS: The fertilization of Batrachospermum. Ann. of Bot. **10**: 49. 1896.

These can only be obtained from material very carefully killed and fixed, perhaps after special methods. I must believe that we shall not feel sure of the processes in Batrachospermum until the technique of the investigation is developed to a point much superior to that of either Schmidle or myself.—BRADLEY MOORE DAVIS.

BARTHOLD HANSTEEN publishes the extended results of his researches on the synthesis of proteids in green phanerogams in Pringsheim's *Jahrbücher*.[11] He used *Lemna minor*, *Vicia Faba*, and *Ricinus communis* as experimental plants. His summary we translate:

1. In general, at least, light plays no direct rôle in the synthesis of proteids in the bodies of green phanerogamous plants. In these the formation of proteids occurs in active cells without the influence of light and independent of the time of year, if only suitable conditions for growth be present.

a. Glutamin, asparagin, urea, ammonium chlorid or ammonium sulfate combine with available grape sugar or—at least the four last named nitrogen compounds—with the direct reducing sugar formed in the digestion of starch.

b. Urea or glycocoll generally unite either with available cane sugar or probably indirectly reducing sugar.

2. The chemical nature of the immediately available carbohydrate is not unimportant for proteid synthesis; on it primarily depends whether the formation of proteid is effected or not.

3. The various amides (amido-acids) or nitrogen compounds are generally not physiologically equivalent for proteid formation. The best suited for this purpose is urea, whose transformation into proteid occurs as energetically with cane sugar as with grape sugar. On the contrary, leucin, alanin, and creatin cannot be looked upon as materials so suitable for proteid making; for even under the most favorable conditions, and equally whether direct or indirect reducing sugar in suitable amounts is simultaneously accumulated in the cells, proteid formation from these compounds fails.—C. R. B.

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[11] Jahrb. f. wiss. Bot. 33: 417–486. 1899.